Lesson 9 Worksheet

September 11, 2017

1. Find the derivative of the following functions:
   (a) $f(x) = x^3(5x - x^2)$
   (b) $g(x) = (\sqrt{x} - x)(4x^3 + 7)$
   (c) $y = \sin^2 x$
   (d) $h(x) = 4e^x \cos x$
   (e) $y = -3\sqrt{x}e^x$
   (f) $y = xe^x \sin x$
2. Find the derivative of the following functions at the given point.
   (a) $f(x) = x^{2/3}(2x - x^2)$ at $x = 8$
   (b) $h(x) = x^2 \sin x$ at $x = \pi$
   (c) $y = (\sqrt{x} + 1)(x - x^{3/2})$ at $x = 9$
   (d) $g(x) = \sin x(\cos x + \sin x)$ at $x = \dfrac{\pi}{6}$
3. Find the equation of the tangent line for each of the functions in part (2) at the given point.

Answers:

1. a. $-5x^4 + 20x^3$
   b. $14x^{5/2} - 16x^3 + \dfrac{7}{2\sqrt{x}} - 7$
   c. $2\sin x \cos x$
   d. $4e^x \cos x - 4e^x \sin x$
   e. $-3e^x(\dfrac{1}{2\sqrt{x}} - 3\sqrt{x})$
   f. $e^x \sin x + xe^x \sin x + xe^x \cos x$
2. a. -72
   b. $-\pi^2$
   c. -17
   d. $\dfrac{1+\sqrt{3}}{2}$
3. a. $y = 384 - 72x$
   b. $y = \pi^3 - \pi^2 x$
   c. $y = 81 - 17x$
   d. $y = \left(\dfrac{\sqrt{3}+1}{2}\right)\left(x - \dfrac{\pi}{6}\right) + \left(\dfrac{\sqrt{3}+1}{4}\right)$